



## SEQUENCE LISTING

<110> Tuomanen, Elaine I  
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<120> POLYPEPTIDE COMPRISING THE AMINO ACID OF AN N-TERMINAL  
CHOLINE BINDING PROTEIN A TRUNCATE, VACCINE DERIVED  
THEREFROM AND USES THEREOF

<130> 5853-2 (207989)

<140> 09/056,019

<141> 1998-04-07

<160> 42

<170> PatentIn Ver. 2.0

<210> 1

<211> 406

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

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Glu	Ser	Gln	Ala	Glu	Gln	Gly	Glu	Gln	Pro	Lys	Lys	Leu	Asp	Ser	Glu
		20						25					30		

Arg	Asp	Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val
	35						40					45			

Gly	Glu	Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val
	50					55					60				

Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys
65					70					75				80	

Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu
				85					90					95	

Ser	Arg	Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser
			100					105					110		

Ser	Ser	Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp
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Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu
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Ala	Lys	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys
145						150				155					160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205  
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220  
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
 225 230 235 240  
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
 245 250 255  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 260 265 270  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
 275 280 285  
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 290 295 300  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 305 310 315 320  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 325 330 335  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 340 345 350  
 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
 355 360 365  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
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 Val Lys Glu Lys Pro Ala  
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<210> 2

<211> 655

<212> PRT

<213> Streptococcus pneumoniae

<400> 2

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 Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45  
 Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60  
 Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80  
 Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95  
 Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110  
 Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125  
 Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140  
 Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160  
 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205  
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220  
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg  
 225 230 235 240  
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg  
 245 250 255  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 260 265 270  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
 275 280 285  
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 290 295 300  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 305 310 315 320

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 325 330 335  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 340 345 350  
 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
 355 360 365  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
 370 375 380  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
 385 390 395 400  
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys  
 405 410 415  
 Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln  
 420 425 430  
 Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
 435 440 445  
 Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
 450 455 460  
 Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
 465 470 475 480  
 Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala  
 485 490 495  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn  
 500 505 510  
 Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 515 520 525  
 Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly  
 530 535 540  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu  
 545 550 555 560  
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala  
 565 570 575  
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 580 585 590  
 Gly Asp Met Ala Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr  
 595 600 605  
 Leu Glu Ala Ser Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser  
 610 615 620

Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val Asn Thr  
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Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn  
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<210> 3

<211> 284

<212> PRT

<213> Streptococcus pneumoniae

<400> 3

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 1 5 10 15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
 20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys  
 195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu  
 210 215 220

Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg

225		230		235		240									
Arg	Ala	Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg
				245					250					255	
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
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		275					280								

<210> 4  
 <211> 106  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 4
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Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
20 25 30
Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
35 40 45
Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
50 55 60
Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
65 70 75 80
Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys
85 90 95
Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala
100 105

<210> 5  
 <211> 109  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 5
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1 5 10 15
Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
20 25 30
Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
35 40 45
Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn
50 55 60

Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu  
65 70 75 80

Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg  
85 90 95

Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala  
100 105

<210> 6

<211> 4

<212> PRT

<213> Streptococcus pneumoniae

<220>

<221> NON\_CONS

<222> (2)..(3)

<223> They could be any amino acid at these two  
locations.

<400> 6

Lys Xaa Xaa Glu  
1

<210> 7

<211> 376

<212> PRT

<213> Streptococcus pneumoniae

<400> 7

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
1 5 10 15

Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
 130 135 140  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 145 150 155 160  
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
 165 170 175  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 180 185 190  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
 195 200 205  
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
 210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240  
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
 245 250 255  
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
 260 265 270  
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
 275 280 285  
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
 290 295 300  
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
 305 310 315 320  
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
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 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
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 Asp Lys Val Lys Glu Lys Pro Ala  
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<210> 8

<211> 663

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

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 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
 35 40 45  
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
 50 55 60  
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
 65 70 75 80  
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
 85 90 95  
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
 100 105 110  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 115 120 125  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
 130 135 140  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 145 150 155 160  
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
 165 170 175  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 180 185 190  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
 195 200 205  
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
 210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240  
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
 245 250 255  
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
 260 265 270  
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
 275 280 285  
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
 290 295 300  
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
 305 310 315 320

Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
 340 345 350  
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
 355 360 365  
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala  
 370 375 380  
 Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln  
 385 390 395 400  
 Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala  
 405 410 415  
 Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro  
 420 425 430  
 Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys  
 435 440 445  
 Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala  
 450 455 460  
 Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 465 470 475 480  
 Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 485 490 495  
 Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly  
 500 505 510  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu  
 515 520 525  
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala  
 530 535 540  
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn  
 545 550 555 560  
 Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr  
 565 570 575  
 Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly  
 580 585 590  
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val  
 595 600 605  
 Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys  
 610 615 620

Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly  
625 630 635 640

Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn  
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Ala Asn Gly Glu Trp Val Asn  
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<210> 9

<211> 254

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
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20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
130 135 140

Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
145 150 155 160

Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
165 170 175

Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
180 185 190

Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
195 200 205

Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala

210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240

Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu  
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<210> 10  
 <211> 106  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 10  
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Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Ser Asp Val  
 35 40 45

Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 50 55 60

Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser  
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Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
 85 90 95

Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala  
 100 105

<210> 11  
 <211> 107  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 11  
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Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys  
 35 40 45

Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
 50 55 60

Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys  
 65 70 75 80

Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys  
85 90 95

Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala  
100 105

<210> 12  
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<212> DNA  
<213> Streptococcus pneumoniae

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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagagggtc 120  
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaaa 240  
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300  
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
aaggtagcag aagctaagaa gaagggtgaa gaagctgaga aaaaagccaa ggatcaaaaa 480  
gaagaagatc gtcgtaacta cccaaccatt acttacaata cgcttgaact tgaaattgct 540  
gagtcgatg tggaagttaa aaaagcggag cttgaactag taaaagtga agctaacgaa 600  
cctcgagacg agcaaaaaat taagcaagca gaagcgggaag ttgagagtaa acaagctgag 660  
gctacaagggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
agagcagatg cttaaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780  
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gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900  
aaggttgaag aagctaagaa aaaagccgag gatcaaaaag agaagatcg ccgtaactac 960  
ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020  
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gttaaagaaa aaccagctg 1219

<210> 13  
<211> 1969  
<212> DNA  
<213> Streptococcus pneumoniae

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gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagagggtc 120  
gaggaatatg taataaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180  
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaaa 240  
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300  
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360  
tccactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420  
aaggtagcag aagctaagaa gaagggtgaa gaagctgaga aaaaagccaa ggatcaaaaa 480  
gaagaagatc gtcgtaacta cccaaccatt acttacaata cgcttgaact tgaaattgct 540  
gagtcgatg tggaagttaa aaaagcggag cttgaactag taaaagtga agctaacgaa 600  
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gctacaagggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720  
agagcagatg cttaaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780  
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840  
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900

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aagggttgaag aagctaagaa aaaagccgag gatcaaaaag aagaagatcg ccgtaactac 960
ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020
aaagcggagg cttgaactag taaaagagga agctaaggaa cctcgaaacg aggaaaaagt 1080
taagcaagca aaagcgggaag ttgagagtaa aaaagctgag gctacaagggt tagaaaaaat 1140
caagacagat cgtaaaaaag cagaagaaga agctaaacga aaagcagcag aagaagataa 1200
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agctccagct ccaaaaaccag agaatccagc tgaacaacca aaagcagaaa aaccagctga 1320
tcaacaagct gaagaagact atgctcgtag atcagaagaa gaatataatc gcttgactca 1380
acagcaaccg ccaaaaactg aaaaaccagc acaaccatct actccaaaaa caggctggaa 1440
acaagaaaac ggtatgtggt acttctacaa tactgatggt tcaatggcga caggatggct 1500
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gaaagatgga gatacctggt actatcttga agcatcaggt gctatgaaag caagccaatg 1860
gttcaaagta tcagataaat ggtactatgt caatggctca ggtgcccttg cagtcaacac 1920
aactgtagat ggctatggag tcaatgccaa tggatgaatgg gtaaaactaa 1969

```

<210> 14

<211> 853

<212> DNA

<213> Streptococcus pneumoniae

<400> 14

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gagaacgagg gagctaccca agtaccact tcttctaata gggcaaatga aagtcaggca 60
gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagagggtc 120
gaggaatatg taaaaaaaat agtgggtgag agctatgcaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt ctctgtcaag ttcagactct 360
tccactaaac cggaagcttc agatacagcg aagccaacaa agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaagggtgaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtaacta cccaaccatt acttacaata cgcttgaact tgaaattgct 540
gagtccgatg tggaaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcgggaag ttgagagtaa acaagctgag 660
gctacaagggt taaaaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720
agagcagatg ctaaagagca aggtaaacca aaggggcggg caaaacgagg agttcctgga 780
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840
gaagaaactc ttc 853

```

<210> 15

<211> 318

<212> DNA

<213> Streptococcus pneumoniae

<400> 15

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aaaccagaaa aaaaggtagc agaagctgag aagaagggtg aagaagctaa gaaaaaagcc 60
gaggatcaaa aagaagaaga tcgccgtaac tacccaacca atacttaca aacgcttgaa 120
cttgaaattg ctgagtcgga tgtggaagtt aaaaaagcgg agcttgaact agtaaaagag 180
gaagctaagg aacctcgaaa cgaggaaaaa gttaagcaag caaaagcggg agttgagagt 240
aaaaaagctg aggtacaaag gttagaaaaa atcaagacag atcgtaaaaa agcagaagaa 300
gaagctaaac gaaaagca 318

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<210> 16

<211> 327

<212> DNA

<213> Streptococcus pneumoniae

<400> 16

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acagaaccag gagaaaaggt agcagaagct aagaagaagg ttgaagaagc tgagaaaaaa 60
gccaaaggatc aaaaagaaga agatcgtcgt aactacccaa ccattactta caaaacgctt 120
gaacttgaaa ttgctgagtc cgatgtggaa gttaaaaaaag cggagcttga actagtaaaa 180
gtgaaagcta acgaacctcg agacgagcaa aaaattaagc aagcagaagc ggaagttgag 240
agtaaacaag ctgagggtac aagggttaaaa aaaatcaaga cagatcgtga agaagcagaa 300
gaagaagcta aacgaagagc agatgct                                     327
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<210> 17

<211> 1129

<212> DNA

<213> Streptococcus pneumoniae

<400> 17

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gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaaacg 180
aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaaat 720
gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aagggtgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960
gctaagggaac ctcgagacga ggaaaaaatt aagcaagcaa aagcgaaggt tgagagtaaa 1020
aaagctgagg ctacaagggt agaaaaacatc aagcacagatc gtaaaaaaagc agaagaagaa 1080
gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctg                                     1129
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<210> 18

<211> 1992

<212> DNA

<213> Streptococcus pneumoniae

<400> 18

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gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaaacg 180
aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
ataaaagcaa agttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
aaagaagaag atcgtcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaaat 720
gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
tcaggaaaaa aggtagcaga agctgagaag aagggtgaag aagctgagaa aaaagccaag 840
gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
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gaaattgctg	agtccgatgt	gaaagttaaa	gaagcggagc	ttgaactagt	aaaagaggaa	960
gctaaggaac	ctcgagacga	ggaaaaaatt	aagcaagcaa	aagcgaaagt	tgagagtaaa	1020
aaagctgagg	ctacaagggt	agaaaaacatc	aagacagatc	gtaaaaaagc	agaagaagaa	1080
gctaaacgaa	aagcagcgaga	agaagataaa	gttaaagaaa	aaccagctga	acaaccacaa	1140
ccagcgccgg	ctactcaacc	agaaaaacca	gctccaaaac	cagagaagcc	agctgaacaa	1200
ccaaaagcag	aaaaaacaga	tgatcaacaa	gctgaagaag	actatgctcg	tagatcagaa	1260
gaagaatata	atcgcttgac	tcaacagcaa	ccgccaaaaa	ctgaaaaacc	agcacaacca	1320
tctactccaa	aaacaggctg	gaaacaagaa	aacgggtatgt	ggtactttcta	caatactgat	1380
ggttcaatgg	caacaggatg	gctccaaaac	aacgggttcat	ggtactatct	aaacgctaata	1440
ggtgctatgg	cgacaggatg	gctccaaaac	aatgggttcat	ggtactatct	aaacgctaata	1500
ggttcaatgg	caacaggatg	gctccaaaac	aatgggttcat	ggtactacct	aaacgctaata	1560
ggtgctatgg	cgacaggatg	gctccaatac	aatgggttcat	ggtactacct	aaacagcaat	1620
ggcgctatgg	cgacaggatg	gctccaatac	aatgggttcat	ggtactacct	caacgctaata	1680
ggtgatatgg	cgacaggatg	gctccaaaac	aacgggttcat	ggtactacct	caacgctaata	1740
ggtgatatgg	cgacaggatg	gctccaatac	aacgggttcat	ggtattacct	caacgctaata	1800
ggtgatatgg	cgacaggatg	ggtgaaagat	ggagataacct	ggtactatct	tgaagcatca	1860
ggtgctatga	aagcaagcca	atgggttcaaa	gtatcagata	aatgggtacta	tgtcaatggc	1920
tcaggtgccc	ttgcagtcaa	cacaactgta	gatgggctatg	gagtcaatgc	caatggtgaa	1980
tgggtaaact	aa					1992

<210> 19

<211> 763

<212> DNA

<213> Streptococcus pneumoniae

<400> 19

gaaaaacgaag	gaagtaccca	agcagccact	tcttctaata	tggcaaagac	agaacatagg	60
aaagctgcta	aacaagtcgt	cgatgaatat	atagaaaaaa	tgttgagggg	gattcaacta	120
gatagaagaa	aacataccca	aaatgtcgcc	ttaaacataa	agttgagcgc	aattaaaacg	180
aagtattttgc	gtgaattaaa	tgttttagaa	gagaagtcga	aagatgagtt	gccgtcagaa	240
ataaaaagcaa	agttagacgc	agctttttgag	aagtttaaaa	aagatacatt	gaaaccagga	300
gaaaaaggtag	cagaagctaa	gaagaagggt	gaagaagcta	agaaaaaagc	cgaggatcaa	360
aaagaagaag	atcgtcgtaa	ctacccaacc	aatacttaca	aaacgcttga	acttgaaatt	420
gctgagttcg	atgtgaaaagt	taaagaagcg	gagcttgaac	tagtaaaaga	ggaagctaaa	480
gaatctcgaa	acgagggcac	aattaagcaa	gcaaaaagaga	aagttgagag	taaaaaagct	540
gaggctacaa	ggttagaaaa	catcaagaca	gatcgtaaaa	aagcagaaga	agaagctaaa	600
cgaaaagcag	atgctaagtt	gaaggaagct	aatgtagcga	cttcagatca	aggtaaacca	660
aaggggcggg	caaaacgagg	agttcctgga	gagctagcaa	cacctgataa	aaaagaaaat	720
gatgcgaagt	cttcagattc	tagcgtaggt	gaagaaactc	ttc		763

<210> 20

<211> 318

<212> DNA

<213> Streptococcus pneumoniae

<400> 20

aaatcaggaa	aaaaggtagc	agaagctgag	aagaagggtg	aagaagctga	gaaaaaagcc	60
aaggatcaaa	aagaagaaga	tcgccgtaac	tacccaacca	atacttaca	aacgcttgac	120
cttgaaattg	ctgagtcgga	tgtgaaagtt	aaagaagcgg	agcttgaact	agtaaaagag	180
gaagctaagg	aacctcgaga	cgaggaaaaa	attaagcaag	caaaagcgaa	agttgagagt	240
aaaaaagctg	aggctacaag	gttagaaaac	atcaagacag	atcgtaaaaa	agcagaagaa	300
gaagctaaac	gaaaagca					318

<210> 21

<211> 321

<212> DNA

<213> Streptococcus pneumoniae



<400> 21  
ccaggagaaa aggttagcaga agctaagaag aaggttgaag aagctaagaa aaaagccgag 60  
gatcaaaaag aagaagatcg tcgtaactac ccaaccaata cttacaaaac gcttgaactt 120  
gaaattgctg agttcgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 180  
gctaaagaat ctcgaaacga gggcacaatt aagcaagcaa aagagaaaagt tgagagtaaa 240  
aaagctgagg ctacaagggtt agaaaaacatc aagacagatc gtaaaaaaagc agaagaagaa 300  
gctaaacgaa aagcagatgc t 321

<210> 22  
<211> 121  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 22  
Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys  
1 5 10 15  
Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg  
20 25 30  
Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala  
35 40 45  
Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu  
50 55 60  
Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala  
65 70 75 80  
Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys  
85 90 95  
Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu  
100 105 110  
Glu Asp Lys Val Lys Glu Lys Pro Ala  
115 120

<210> 23  
<211> 122  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 23  
Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys  
1 5 10 15  
Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp  
20 25 30  
Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile  
35 40 45  
Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys  
50 55 60

Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys  
 65 70 75 80  
 Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile  
 85 90 95  
 Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala  
 100 105 110  
 Glu Glu Asp Lys Val Lys Glu Lys Arg Ala  
 115 120

<210> 24  
 <211> 428  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 24  
 Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn  
 1 5 10 15  
 Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu  
 20 25 30  
 Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val  
 35 40 45  
 Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val  
 50 55 60  
 Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys  
 65 70 75 80  
 Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu  
 85 90 95  
 Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser  
 100 105 110  
 Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp  
 115 120 125  
 Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu  
 130 135 140  
 Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys  
 145 150 155 160  
 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu  
 165 170 175  
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu  
 180 185 190  
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys

195	200	205
Gln Ala Glu Ala Glu Val	Glu Ser Lys Gln Ala	Glu Ala Thr Arg Leu
210	215	220
Lys Lys Ile Lys Thr	Asp Arg Glu Glu Ala	Glu Glu Glu Ala Lys Arg
225	230	235 240
Arg Ala Asp Ala	Lys Glu Gln Gly Lys	Pro Lys Gly Arg Ala Lys Arg
245	250	255
Gly Val Pro Gly Glu Leu Ala	Thr Pro Asp Lys Lys Glu	Asn Asp Ala
260	265	270
Lys Ser Ser Asp Ser Ser Val	Gly Glu Glu Thr Leu	Pro Ser Pro Ser
275	280	285
Leu Lys Pro Glu Lys Lys Val	Ala Glu Ala Glu Lys Lys	Val Glu Glu
290	295	300
Ala Lys Lys Lys Ala Glu Asp	Gln Lys Glu Glu Asp Arg Arg	Asn Tyr
305	310	315 320
Pro Thr Asn Thr Tyr Lys Thr	Leu Glu Leu Glu Ile Ala Glu	Ser Asp
325	330	335
Val Glu Val Lys Lys Ala Glu	Leu Glu Leu Val Lys Glu Glu	Ala Lys
340	345	350
Glu Pro Arg Asn Glu Glu Lys	Val Lys Gln Ala Lys Ala Glu	Val Glu
355	360	365
Ser Lys Lys Ala Glu Ala Thr	Arg Leu Glu Lys Ile Lys Thr	Asp Arg
370	375	380
Lys Lys Ala Glu Glu Glu Ala	Lys Arg Lys Ala Ala Glu Glu	Asp Lys
385	390	395 400
Val Lys Glu Lys Pro Ala Glu	Gln Pro Gln Pro Ala Pro Ala	Pro Lys
405	410	415
Ala Glu Lys Pro Ala Pro Ala	Pro Lys Pro Glu Asn	
420	425	

<210> 25  
 <211> 23  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 25  
 ggcggatcca tggaraayga rgg

23

<210> 26  
 <211> 33  
 <212> DNA  
 <213> Streptococcus pneumoniae

<400> 26  
 gccgtcgact tagtttaccc attcaccatt ggc

33

<210> 27  
 <211> 5  
 <212> PRT  
 <213> Streptococcus pneumoniae

<220>  
 <221> VARIANT  
 <222> (1)  
 <223> It could be any amino acid.

<400> 27  
 Xaa Glu Asn Glu Gly  
 1 5

<210> 28  
 <211> 439  
 <212> PRT  
 <213> Streptococcus pneumoniae

<220>  
 <221> VARIANT  
 <222> (243)  
 <223> It could be any amino acid.

<400> 28  
 Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys  
 1 5 10 15  
 Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser  
 20 25 30  
 Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys  
 35 40 45  
 Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu  
 50 55 60  
 Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser  
 65 70 75 80  
 Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala  
 85 90 95  
 Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr  
 100 105 110  
 Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 115 120 125  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro  
 130 135 140

Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Asp	Ile	Ala	Glu	Ser	Asp	Val
145					150					155					160
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu
				165					170						175
Ser	Arg	Asp	Glu	Lys	Lys	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Asn
			180					185						190	
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Asn	Ile	Lys	Thr	Asp	Arg	Glu
		195					200					205			
Lys	Ala	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Leu	Gln	Glu	Ala
	210					215					220				
Asn	Val	Ala	Thr	Ser	Glu	Gln	Asp	Lys	Ser	Lys	Arg	Arg	Ala	Lys	Arg
225					230					235					240
Glu	Val	Xaa	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
				245					250					255	
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Thr	Ser	Pro	Ser
			260					265					270		
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu
		275					280						285		
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
	290					295					300				
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp
305					310					315					320
Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys
				325					330					335	
Glu	Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Val	Lys	Ala	Lys	Val	Glu
			340					345					350		
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg
		355					360					365			
Lys	Lys	Ala	Glu	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Ala	Glu	Glu	Asp
	370					375					380				
Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro
385					390					395					400
Gln	Pro	Glu	Lys	Pro	Thr	Glu	Glu	Pro	Glu	Asn	Pro	Ala	Pro	Ala	Pro
				405					410					415	
Ala	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Glu	Lys	Pro	Lys	Ala	Glu	Lys	Pro
			420					425					430		
Ala	Asp	Gln	Gln	Ala	Glu	Glu									
			435												

<210> 29  
 <211> 437  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 29

Ala	Val	Ala	Ser	Leu	Phe	Met	Gly	Ser	Val	Val	His	Ala	Thr	Glu	Lys
1				5					10					15	
Glu	Val	Thr	Thr	Gln	Val	Ala	Thr	Ser	Ser	Asn	Arg	Ala	Asn	Lys	Ser
			20					25					30		
Gln	Thr	Glu	His	Met	Lys	Ala	Ala	Lys	Gln	Val	Asp	Glu	Tyr	Ile	Lys
		35					40					45			
Lys	Lys	Leu	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	Gly	Leu
	50					55					60				
Leu	Thr	Lys	Leu	Gly	Val	Ile	Lys	Thr	Glu	Tyr	Leu	His	Gly	Leu	Ser
65					70					75					80
Val	Ser	Lys	Lys	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala
				85					90					95	
Lys	Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr
			100					105					110		
Glu	Pro	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala
		115					120					125			
Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Lys	Asp	Leu	Arg	Asn	Tyr	Pro
	130					135					140				
Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Asp	Ile	Ala	Glu	Ser	Asp	Val
145					150					155					160
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu
				165					170					175	
Ser	Arg	Asp	Glu	Lys	Lys	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Asn
			180					185					190		
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Asn	Ile	Lys	Thr	Asp	Arg	Glu
		195					200					205			
Lys	Ala	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Leu	Gln	Glu	Ala
	210					215					220				
Asn	Val	Ala	Thr	Ser	Glu	Gln	Asp	Lys	Ser	Lys	Arg	Arg	Ala	Lys	Arg
225					230					235					240
Glu	Val	Leu	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
				245					250					255	
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Thr	Ser	Pro	Ser
			260					265					270		

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 275 280 285  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 290 295 300  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 305 310 315 320  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 325 330 335  
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu  
 340 345 350  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 355 360 365  
 Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp  
 370 375 380  
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro  
 385 390 395 400  
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro  
 405 410 415  
 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro  
 420 425 430  
 Ala Asp Gln Gln Ala  
 435

<210> 30  
 <211> 439  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 30  
 Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
 1 5 10 15  
 Lys Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu  
 20 25 30  
 Ser Gln Ala Gly His Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile  
 35 40 45  
 Lys Thr Met Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe Ala  
 50 55 60  
 Leu Asn Ile Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Arg Lys Leu  
 65 70 75 80  
 Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Pro Ser Glu Thr Lys

				85				90				95			
Lys	Glu	Ile	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Asn	Arg
100				105				110							
Thr	Lys	Lys	Thr	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys
115				120				125							
Lys	Lys	Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	His	Arg	Asn	Tyr	Pro	Thr
130				135				140							
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu
145				150				155				160			
Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser
165				170				175							
Arg	Asp	Asp	Glu	Lys	Ile	Lys	Gln	Ala	Glu	Ala	Lys	Val	Glu	Ser	Lys
180				185				190							
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Glu	Lys
195				200				205							
Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Glu	Ala	Lys	Leu	Lys	Glu	Ala
210				215				220							
Val	Glu	Lys	Asn	Val	Ala	Thr	Ser	Glu	Gln	Asp	Lys	Pro	Lys	Gly	Arg
225				230				235				240			
Arg	Lys	Arg	Gly	Val	Pro	Gly	Glu	Gln	Ala	Thr	Pro	Asp	Lys	Lys	Glu
245				250				255							
Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Ala	Leu	Pro
260				265				270							
Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys
275				280				285							
Val	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg
290				295				300							
Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala
305				310				315				320			
Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu
325				330				335							
Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Glu	Lys	Val	Asn	Gln	Ala	Lys	Ala
340				345				350							
Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys
355				360				365							
Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu
370				375				380							
Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro



385		390		395		400
Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro						
	405			410		415
Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr						
	420			425		430
Asp Asp Gln Gln Ala Glu Glu						
	435					
<210> 31						
<211> 419						
<212> PRT						
<213> Streptococcus pneumoniae						
<400> 31						
Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn						
1		5		10		15
Glu Gly Thr Thr Gln Ala Pro Thr Ser Ser Asn Arg Gly Asn Glu Ser						
	20			25		30
Gln Ala Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Glu						
	35			40		45
Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu						
	50			55		60
Leu Thr Lys Leu Gly Ala Ile Lys Thr Glu Tyr Leu Arg Gly Leu Ser						
	65			70		75
Val Ser Lys Glu Lys Ser Thr Ala Glu Leu Pro Ser Glu Ile Lys Glu						
		85		90		95
Lys Leu Thr Ala Ala Phe Lys Gln Phe Lys Lys Asp Thr Leu Lys Pro						
	100			105		110
Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Lys Lys						
	115			120		125
Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile						
	130			135		140
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val						
	145			150		155
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg						
		165		170		175
Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Lys						
	180			185		190
Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Lys Ala						
	195			200		205

Glu Glu Glu Ala Lys Arg Arg Val Asp Ala Lys Glu Gln Asp Glu Ser  
 210 215 220  
 Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Val Gly Glu Gln  
 225 230 235 240  
 Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser  
 245 250 255  
 Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly Lys Lys  
 260 265 270  
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp Lys Lys Ala Lys  
 275 280 285  
 Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys  
 290 295 300  
 Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala  
 305 310 315 320  
 Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu  
 325 330 335  
 Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala  
 340 345 350  
 Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu  
 355 360 365  
 Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala  
 370 375 380  
 Glu Gln Pro Lys Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Ala Pro  
 385 390 395 400  
 Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp  
 405 410 415  
 Gln Gln Ala

<210> 32  
 <211> 437  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 32  
 Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys Glu  
 1 5 10 15  
 Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser Gln  
 20 25 30  
 Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys Lys  
 35 40 45

Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu Leu  
 50 55 60  
 Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser Val  
 65 70 75 80  
 Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala Lys  
 85 90 95  
 Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu  
 100 105 110  
 Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys  
 115 120 125  
 Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro Thr  
 130 135 140  
 Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val Glu  
 145 150 155 160  
 Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser  
 165 170 175  
 Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn Lys  
 180 185 190  
 Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu Lys  
 195 200 205  
 Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala Asn  
 210 215 220  
 Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg Glu  
 225 230 235 240  
 Val Phe Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys  
 245 250 255  
 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser Leu  
 260 265 270  
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala  
 275 280 285  
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 290 295 300  
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
 305 310 315 320  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 325 330 335  
 Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu Ser  
 340 345 350

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys  
 355 360 365  
 Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys  
 370 375 380  
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln  
 385 390 395 400  
 Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Ala  
 405 410 415  
 Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro Ala  
 420 425 430  
 Asp Gln Gln Ala Glu  
 435

<210> 33  
 <211> 433  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 33  
 Cys Thr Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu  
 1 5 10 15  
 Asn Glu Arg Thr Thr Gln Val Pro Thr Ser Ser Asn Arg Gly Lys Pro  
 20 25 30  
 Glu Arg Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile Asn Lys Met  
 35 40 45  
 Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Leu Ala Phe Asn Ile  
 50 55 60  
 Gln Leu Ser Arg Ile Lys Thr Glu Tyr Leu Asn Gly Leu Lys Glu Lys  
 65 70 75 80  
 Ser Glu Ala Glu Leu Pro Ser Lys Ile Lys Ala Glu Leu Asp Ala Ala  
 85 90 95  
 Phe Lys Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys  
 100 105 110  
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Val Ala  
 115 120 125  
 Glu Ala Lys Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn  
 130 135 140  
 Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Phe  
 145 150 155 160  
 Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala

165										170					175				
Asp	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val				
			180					185					190						
Glu	Ser	Glu	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp				
		195					200					205							
Arg	Glu	Lys	Ala	Glu	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys				
	210					215					220								
Glu	Gln	Asp	Glu	Ser	Lys	Arg	Arg	Lys	Ser	Arg	Gly	Lys	Arg	Gly	Ala				
225					230					235					240				
Leu	Gly	Glu	Gln	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser				
				245					250					255					
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys				
			260					265						270					
Pro	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Asp				
		275					280						285						
Lys	Lys	Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr				
	290					295					300								
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys				
305					310					315					320				
Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser				
				325					330					335					
Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys				
			340					345					350						
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys				
		355					360					365							
Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys				
	370					375					380								
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu				
385					390					395					400				
Lys	Pro	Ala	Glu	Glu	Pro	Glu	Asn	Pro	Val	Pro	Ala	Pro	Lys	Pro	Glu				
				405					410					415					
Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp	Gln	Gln	Ala				
			420					425					430						

Glu

<210> 34  
 <211> 427  
 <212> PRT

<213> Streptococcus pneumoniae

<400> 34

Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly	Ser	Val	Val	His	Ala	Thr	Glu	
1				5					10					15		
Lys	Glu	Val	Thr	Thr	Gln	Val	Pro	Thr	Tyr	Ser	Asn	Met	Ala	Lys	Thr	
			20					25					30			
Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu	Lys	
		35					40					45				
Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Phe	
	50					55					60					
Ala	Phe	Asn	Met	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Glu	Tyr	Leu	Tyr	Gly	
65					70					75					80	
Leu	Lys	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Val	Lys	Ala	Lys	
				85					90					95		
Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Leu	Gly	
			100					105					110			
Glu	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	
		115					120					125				
Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	
	130					135					140					
Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	
145				150						155					160	
Lys	Ala	Glu	Leu	Glu	Leu	Leu	Lys	Glu	Glu	Ala	Lys	Thr	Arg	Asn	Glu	
			165					170						175		
Asp	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	
		180					185						190			
Ala	Thr	Lys	Leu	Glu	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	
		195					200					205				
Glu	Ala	Lys	Arg	Lys	Ala	Glu	Ala	Glu	Glu	Asp	Lys	Val	Lys	Asp	Lys	
	210					215					220					
Leu	Lys	Arg	Arg	Thr	Lys	Arg	Ala	Val	Pro	Gly	Glu	Pro	Ala	Thr	Pro	
225				230						235					240	
Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	
			245					250						255		
Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	
		260					265						270			
Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	
	275					280						285				

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp  
 290 295 300  
 Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu  
 305 310 315 320  
 Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn Glu Glu Lys Ile Asn  
 325 330 335  
 Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu  
 340 345 350  
 Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg  
 355 360 365  
 Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro  
 370 375 380  
 Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu  
 385 390 395 400  
 Asn Pro Ala Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys  
 405 410 415  
 Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu  
 420 425

<210> 35  
 <211> 413  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 35  
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys  
 1 5 10 15  
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu  
 20 25 30  
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn  
 35 40 45  
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg  
 50 55 60  
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu  
 65 70 75 80  
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr  
 85 90 95  
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu  
 100 105 110  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 115 120 125

Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp  
 130 135 140  
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 145 150 155 160  
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu  
 165 170 175  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg  
 180 185 190  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys  
 195 200 205  
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala  
 210 215 220  
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn  
 225 230 235 240  
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser  
 245 250 255  
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val  
 260 265 270  
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg  
 275 280 285  
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu  
 290 295 300  
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu  
 305 310 315 320  
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys  
 325 330 335  
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr  
 340 345 350  
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu  
 355 360 365  
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala  
 370 375 380  
 Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln  
 385 390 395 400  
 Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu  
 405 410

<210> 36



<211> 425  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 36

Tyr	Ile	Ala	Ser	Leu	Phe	Leu	Gly	Gly	Val	Val	His	Ala	Glu	Gly	Val
1				5					10					15	
Arg	Ser	Glu	Asn	Asn	Pro	Thr	Val	Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser
			20					25					30		
Lys	Lys	Tyr	Ala	Asp	Glu	Val	Lys	Ser	His	Leu	Glu	Lys	Ile	Leu	Ser
		35					40					45			
Glu	Ile	Gln	Thr	Asn	Leu	Asp	Arg	Ser	Lys	His	Ile	Lys	Thr	Val	Asn
	50					55					60				
Leu	Ile	Asn	Lys	Leu	Gln	Asp	Ile	Lys	Arg	Thr	Tyr	Leu	Tyr	Glu	Leu
65					70					75					80
Asn	Val	Leu	Glu	Asp	Lys	Ser	Lys	Ala	Glu	Leu	Pro	Ser	Lys	Ile	Lys
				85					90					95	
Ala	Glu	Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro
			100					105					110		
Thr	Glu	Pro	Gly	Lys	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	Glu
		115					120					125			
Ala	Glu	Lys	Lys	Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Tyr	Arg	Asn	Tyr
	130					135					140				
Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp
145					150					155					160
Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Lys	Glu	Ala	Asp
				165					170					175	
Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu
			180					185					190		
Ser	Glu	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg
		195					200					205			
Glu	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Glu	Gln
	210					215					220				
Asp	Glu	Ser	Lys	Arg	Arg	Lys	Ser	Arg	Val	Lys	Arg	Gly	Asp	Phe	Gly
225					230					235					240
Glu	Pro	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp
				245					250					255	
Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	Pro	Gly
			260					265					270		
Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys

275	280	285
Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Ile Thr 290 295 300		
Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys 305 310 315 320		
Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn 325 330 335		
Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala 340 345 350		
Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu 355 360 365		
Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys 370 375 380		
Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro 385 390 395 400		
Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu 405 410 415		
Lys Pro Ala Asp Gln Gln Ala Glu Glu 420 425		

<210> 37  
 <211> 439  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 37
Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val Arg Ser 1 5 10 15
Gly Asn Asn Ser Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys 20 25 30
Tyr Ala Asp Glu Val Glu Ser His Leu Gln Ser Ile Leu Lys Asp Val 35 40 45
Asn Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Ala Asp Phe Asn 50 55 60
Lys Lys Leu Ser Lys Ile Lys Thr Lys Tyr Leu Tyr Glu Leu Asn Val 65 70 75 80
Leu Glu Glu Lys Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr 85 90 95
Lys Glu Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu 100 105 110

Ser	Thr	Glu	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	115	120	125
Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	130	135	140
Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	145	150	155
Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	165	170	175
Asn	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Glu	Ala	Lys	Val	180	185	190
Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	195	200	205
Arg	Glu	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	210	215	220
Glu	Gln	Ala	Glu	Glu	Glu	Ala	Lys	Val	Lys	Asp	Glu	Pro	Lys	Lys	Arg	225	230	235
Thr	Lys	Arg	Gly	Val	Leu	Gly	Glu	Pro	Ala	Thr	Pro	Asp	Lys	Lys	Glu	245	250	255
Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	260	265	270
Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	275	280	285
Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	290	295	300
Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	305	310	315
Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	325	330	335
Glu	Ala	Lys	Glu	Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	340	345	350
Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	355	360	365
Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	370	375	380
Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	385	390	395
Ala	Pro	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Pro	405	410	415

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Ala Asp Gln Gln Ala Glu Glu  
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<211> 460

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

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Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu  
20 25 30

Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg  
35 40 45

Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly  
50 55 60

Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala  
65 70 75 80

Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile  
85 90 95

Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser  
100 105 110

Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser  
115 120 125

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr  
130 135 140

Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala  
145 150 155 160

Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu  
165 170 175

Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu  
180 185 190

Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu  
195 200 205

Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln  
210 215 220

Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys  
225 230 235 240



35					40					45					
Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val	Gly	Glu
50						55					60				
Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val	Ala	Leu
65					70					75					80
Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys	Ile	Val
				85					90					95	
Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu	Ser	Arg
			100					105					110		
Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser	Ser	Ser
		115						120				125			
Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp	Thr	Ala
		130					135					140			
Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys
145					150					155					160
Lys	Lys	Val	Glu	Glu	Val	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu
				165					170					175	
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu
			180					185					190		
Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val
		195					200					205			
Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Lys	Gln	Lys	Ile	Lys	Gln	Ala
	210					215					220				
Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys
225					230					235					240
Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala
				245					250					255	
Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Pro	Lys	Arg	Gly	Val
			260					265					270		
Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser
		275					280					285			
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys
	290					295					300				
Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys
305					310					315					320
Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr
				325					330					335	
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu



Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro  
 130 135 140  
 Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val  
 145 150 155 160  
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu  
 165 170 175  
 Ser Arg Asp Glu Gly Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Ser  
 180 185 190  
 Lys Lys Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu  
 195 200 205  
 Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu  
 210 215 220  
 Ala Asn Val Ala Ser Glu Gln Asp Lys Pro Lys Gly Arg Ala Lys Arg  
 225 230 235 240  
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala  
 245 250 255  
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser  
 260 265 270  
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu  
 275 280 285  
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr  
 290 295 300  
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp  
 305 310 315 320  
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys  
 325 330 335  
 Glu Ser Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu  
 340 345 350  
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg  
 355 360 365  
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys  
 370 375 380  
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln  
 385 390 395 400  
 Pro Glu Lys Pro Ala Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Pro  
 405 410 415  
 Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp  
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Gln Gln Ala Glu Glu  
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